

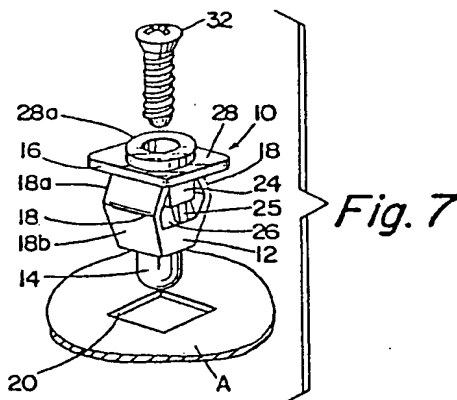
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(54) Deformable Fasteners

(57) A one-piece plastics fastener (10) comprises a body portion (12) adapted to receive and retain an externally threaded fastener (32) and connected to a head portion (16) by a plurality of collapsible legs (18) adapted to collapse as the body portion (12) is drawn toward head portion (16) by rotation of the threaded fastener (32), in which there

are provided raised, axial ribs (25) projecting *either* from cam surfaces (26) of the body portion (12) *or* from tabs (24) on the head portion (16), the ribs (25) being slidably received in an axially extending slot formed *either* in the tabs (24) *or* in the cam surfaces (26), in order to resist rotation of the body portion (12) relative to the head portion (16), the cam surfaces (26) and the tabs (24) being in sliding contact.



The drawings originally filed were informal and the print here reproduced is taken from a later filed formal copy.

## SPECIFICATION Fastener

The present invention relates to plastic fasteners of the toggle type and more particularly relates to an improved plastic fastener of the toggle type comprising a head portion, a body portion adapted to receive and retain an externally threaded fastener such as a screw and a plurality of collapsible locking legs extending between the body portion and the head portion and adapted to be collapsed as the externally threaded member draws the body portion toward the head portion, means adapted to prevent or minimize rotation of the body portion and/or the legs relative to the head portion being provided.

Plastic fasteners of the toggle type are well known in the prior art. Examples of such fasteners may be seen by reference to United States Patents Nos. 3,478,395 and 3,313,083, both assigned to the assignee of the present invention and both merely incorporated by reference.

Such prior art fasteners are typically utilized to join two or more overlying panels or to retain a threaded member to a panel, typically panels having polygonal apertures therein and accessible from only one side thereof. Such prior art fasteners have been very useful in many situations, however, as tightening of the externally threaded member tended to cause rotation of the body portion and/or the legs relative the head portion in certain circumstances, which tended to weaken the fastener and/or joint formed thereby, the prior art fasteners have in certain circumstances, been somewhat less than totally satisfactory.

The present invention is aimed at overcoming or minimizing the above mentioned drawback of the prior art by the provision of a plastic toggle type fastener comprising a head portion, a body portion adapted to receive an externally threaded fastener and a plurality of collapsible legs extending between the head and body portions and adapted to collapse as the body portion is drawn toward the head portion and wherein rotation of the body portion or legs relative to the head portion is prevented or minimized. The above is accomplished by providing at least one first surface associated with the head portion in sliding contact with a second surface associated with the body portion. A raised, axially extending rib is provided on one of the surfaces for cooperation with the axially extending slot on the other surface, the cooperation of the rib in the slot tending to prevent rotation of the body portion relative to the head portion.

Figure 1 is an enlarged side elevational view of an improved plastic fastener constructed in accordance with the instant invention.

Figure 2 is an end elevational view of the improved fastener of Figure 1.

Figure 3 is a partially broken view of the improved fastener of Figure 1, to show the cam surfaces and the anti-rotation means on the body portion of the fastener;

Figure 4 is a sectional view taken generally along the plane of line 4—4 of Figure 2, looking in the direction of the arrows;

Figure 5 is a top plan view of the improved fastener illustrated in Figure 1.

Figure 6 is a bottom plan view of the improved fastener illustrated in Figure 1.

Figure 7 is an exploded view of the fastener of Figures 1 through 6 preparatory to insertion of the same in a receiving opening or aperture in a supporting panel, and illustrates the threaded screw member which is adapted for threaded coaction with the fastener to deform or collapse the same into secured relation on the panel;

Figure 8 is a view showing the fastener assembly of Figure 7, assembled on the panel, and ready for rotation of the threaded screw member for collapsing the fastener;

Figure 9 is a view of the improved plastic fastener in partially collapsed or deformed condition, due to threading rotation of the associated screw member and resultant movement of the body portion of the fastener toward the head portion;

Figure 10 is an elevational view illustrating the improved plastic fastener in fully collapsed condition;

Figure 11 is an elevational view taken from the right side of Figure 10, and better illustrating the auxiliary locking tabs on the fastener which aid in locking or securing the fastener to the supporting panel or panels, and which also aid in sealing the apertures in the panels; and

Figure 12 is a view similar to Figures 10 and 11 but showing a modified assembly of a plastic fastener.

Referring to the drawings, and particularly to Figures 1 through 6 thereof, there is shown a plastic fastener 10 comprising a generally wedge-shaped body portion 12 having a protrusion 14 projecting downwardly therefrom. A head portion 16 is secured to the body portion 12, and by means of relatively thin collapsible or deformable strap-like legs 18 extending between the head and body portions, and merging therewith. As best seen for instance in Figure 2, the legs 18 initially diverge or slope slightly outwardly as at 18a and then turn inwardly as at 18b to smoothly merge with the tapered or wedge-shaped body portion 12. Such a diverging arrangement is useful in insertion of the fastener into the opening or aperture 20 in a supporting member or panel A (Fig. 7) and for holding the fastener in assembled relation with the panel prior to its being deformed or collapsed to secured relation on the panel.

The improved fastener may be formed from a single piece of relatively high strength, deformable plastic material, such as for instance nylon. It may be die-molded lending itself to mass production procedures.

As can be best seen in Fig. 4, there is an opening 22 extending through the fastener which is open at its upper end, but preferably closed at its lower end, in the embossment portion 14. Relatively thin plastic sections 23 (Fig. 2) which

sections may be of the order of two-hundredths of an inch thickness, also connect the body portion 12 to the head portion 16. These thin sections supplement the connection of the aforementioned locking legs 18.

Depending from the head portion 16 and on opposite sides of the body portion as compared to the sides of the body portion on which are disposed the strap-like legs 18, are deformable tabs 24, 24a. The lower ends of the tabs define surfaces which are adapted for sliding coaction with tapered cam surfaces 26 (Fig. 4) on the body portion 12, upon inward movement of the body portion toward the head portion, as will be hereinafter described, whereupon the tabs 24, 24a will be forced or deformed outwardly away from one another. A raised rib 25, 25a extends outwardly from each of the tapered cam surfaces 26 and generally parallel to the axis opening 22. An inwardly opening slot, 27, 27a is provided in the radially inward surface of each of the tabs 24, 24a. The slots 27, 27a extend generally parallel to the axis of opening 22 and are aligned with and slightly wider than the width of ribs 25, 25a. As the head portion 16 is drawn towards the body portion 12, the ribs 25, 25a will be slidably received in the slots 27, 27a thereby tending to minimize or prevent rotation of the body portion 12 relative to the head portion 16. Of course, more than one rib and slot may be provided and/or the ribs may extend inwardly from the tabs 24, 24a with the cooperating slots opening outwardly from the cam surfaces 26.

The head 16 preferably embodies a flange portion 28 which flange portion may be adapted for abutting engagement with the confronting side of the supporting panel A, and a collar portion 28a projecting upwardly from the flange. The head has abutment surfaces 30 therein, which are adapted for engagement with the head 32 of the threaded member 34 (Fig. 7) for limiting the movement of the screw into the collar. Head 32 of member 34 may also be of such diameter so as to frictionally engage the interior of head 16 of the fastener 10 during threaded rotation of screw 34. The collar portion 28a is preferably of such depth that the head 32 of the screw is received completely therein upon collapsing of the fastener into its finalized secured condition on the supporting panel or panels A, A', as shown for instance in Figures 10 and 11 of the drawings.

Referring now to Figures 7 through 11, it will be seen that the fastener may be first inserted through aligned polygonal openings in the panels A, A', and the threaded member 34 upon rotation thereof threadedly engages and cuts into the interior surface 38 of opening 22 and commences to draw the body portion 12 axially toward the flanged head portion 16 thereby causing collapsing of the strap-like leg portion 18, which as aforementioned already diverge outwardly with respect to one another at 18a. This initial collapsing may occur before head 32 of the screw engages abutments 30. Further rotation of the threaded member 34 causes further movement of

the body portion 12 toward the head portion and movement of the fastener to its finalizing deformed condition as shown for instance in Figures 10 and 11. During the inward movement of the body portion toward the head portion due to the rotation of the threaded member 34 and its threaded coaction with surface 38 of the fastener, the aforementioned tabs 24, 24a slide on cam surfaces 26, with the ribs 25, 25a slidably received in the slots 27, 27a, and are cammed outwardly by such cam surfaces, thereby forcing the tabs outwardly and forming an auxiliary locking of the fastener to the supporting panels A and A' as shown for instance in Figure 11. Also, such tabs, in combination with the ribs 25, 25a and slots 27, 27a guide the axial movement of the body portion toward the head portion and tend to prevent relative rotation therebetween.

When the fastener is drawn up tight as shown in Figures 10 and 11, the deformed or collapsed legs 18 and the tabs 24, 24a engage in sealing relation with the peripheries of the openings 20 in the panels and effectively seal such openings against the entry of moisture, etc. It will also be seen that due to the closed lower end of the projection 14, no moisture can enter through the passage 22 in the fastener. The screw 34 may be preassembled with the plastic fastener to the general position illustrated in Figure 8, for facilitating the assembly of the fastener to the panels.

Referring now to Figure 12, there is shown a modified assembly wherein the flange portion 28 of the plastic fastener is disposed intermediate supporting panels A and A' and thereby providing an insulator for insulating the panels from one another. In this embodiment, the collar portion 28a may be eliminated, and the head 40 of the screw member 34' may directly engage the confronting surface of the panel A.

Accordingly, an improved toggle type plastic fastener comprising a head portion, a body portion adapted to receive and retain an externally threaded fastener and a plurality of collapsible legs joining the head and body portions and adapted to outwardly collapse as a received externally threaded member draws the body portion toward the head portion is provided which includes means to minimize or prevent rotation of the body portion and/or legs relative to the head portion.

The terms and expressions which have been used are used as terms of description and not of limitation, and there is no intention in the use of such terms and expressions of excluding any equivalents of any of the features shown, or described, or portions thereof, and it is recognized that various modifications are possible within the scope of the invention claimed.

## 125 Claims

1. An improved deformable plastic fastener device adapted for insertion through a polygonal opening in a supporting member, said device comprising, a head portion adapted to be

disposed adjacent one side of said supporting member, said head portion having a bore adapted to receive a threaded member therethrough, a body portion disposed outwardly of said head

5 portion having a bore disposed in axial alignment with the bore in said head portion and adapted for self-threading coaction with a threaded member inserted through a bore therein, said body portion having a polygonal transverse cross-section, a

10 pair of laterally spaced, oppositely disposed leg portions connected at one end adjacent said head portion and at the other end adjacent said body portion, said body portion having a pair of oppositely disposed tapered cam surfaces, a pair

15 of laterally spaced, resilient tabs extending downwardly from said head portion intermediate said leg portions, said tabs being disposed on opposite sides of the said body portion and being disposed generally at right angles to the general

20 plane of the respective legs, said tabs being connected at one end adjacent said head portion and adapted for coacting sliding engagement on said cam surfaces, whereby said body portion is adapted to be progressively drawn toward said

25 head portion to cause axial collapsing deformation of said leg portions and outward movement of said tabs into engagement with the other side of supporting member upon turning movement of said threaded member through the

30 bore in said body portion, wherein at least one raised rib extending from one of the cam surfaces and the tabs is or are provided, said ribs extending generally parallel with the axis of said bore and at least one slot formed in the

35 other of the cam surfaces and the tabs, said slot extending generally parallel to the axis of the bore and of a width slightly greater than the width of said rib, said rib adapted to be slidably received in said slot as said body portion is drawn toward

40 said head portion whereby rotation of said body portion relative to said head portion is resisted.

2. A fastener device in accordance with claim 1, wherein said cam surfaces are tapered convergently toward one another in a direction

45 toward said head portion.

3. A fastener device in accordance with claim 1, wherein said body portion includes an integral, hollow protrusion extending downwardly therefrom, said protrusion being closed at one

50 end and having an axial bore disposed in alignment with the bore in said body portion.

4. A fastener device in accordance with claim 1, wherein said body portion includes tapered side surfaces which diverge away from one

55 another in a direction toward said head portion, said leg portions forming a continuation of said tapered side surfaces adjacent their connection to said body portion.

5. The improved fastener of claims 2 or 3, wherein one of said raised ribs extends radially outwardly from each of said cam surfaces and one of said slots is formed in the radially inwardly facing surface of each of said tabs.

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6. An improved plastic toggle type fastener of the type comprising a head portion, a body portion adapted to receive and retain an externally threaded fastener and a plurality of collapsible legs joining the head and leg portions, said leg portions adapted to collapse as a received

65 externally threaded fastener draws the body portion toward the head portion, wherein at least one first surface is or are provided associated with said head portion in sliding contact with a second surface associated with

70 said body portion, a raised axially extending rib extending from one of said first and second surfaces slidably received in an axially extending slot formed in the other of said first and second surfaces.

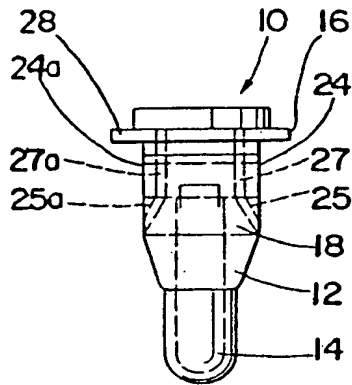
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7. The improved fastener of claim 6 wherein said ribs extend from said second surface and said slots are formed in said first surface.

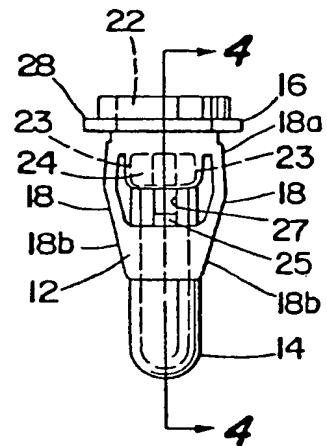
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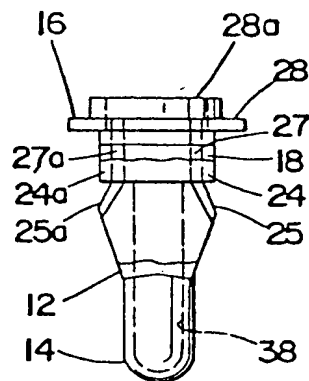
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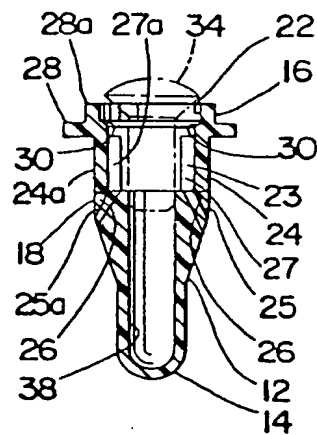
*Fig. 1*



*Fig. 2*



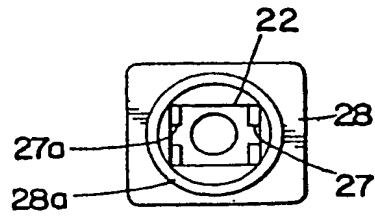
*Fig. 3*



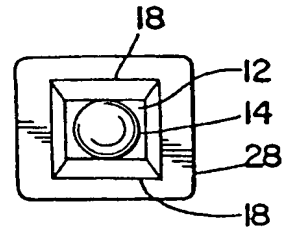
*Fig. 4*

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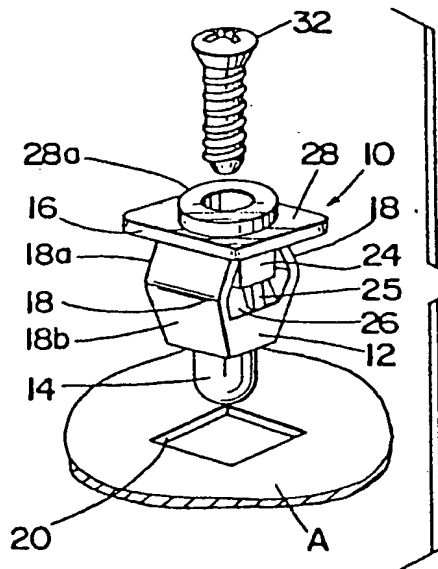
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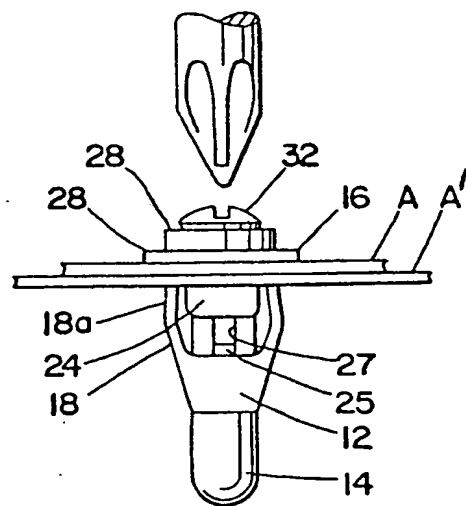
*Fig. 5*



*Fig. 6*



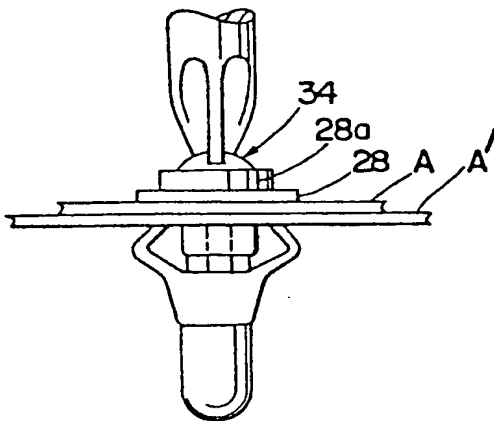
*Fig. 7*



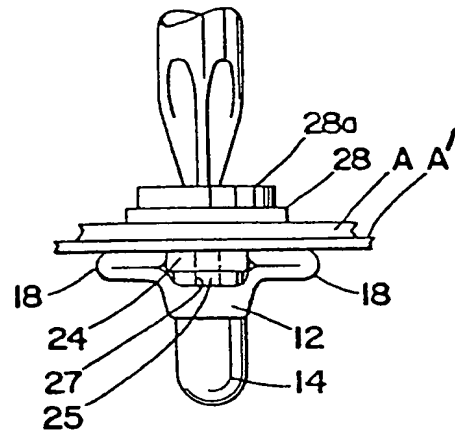
*Fig. 8*

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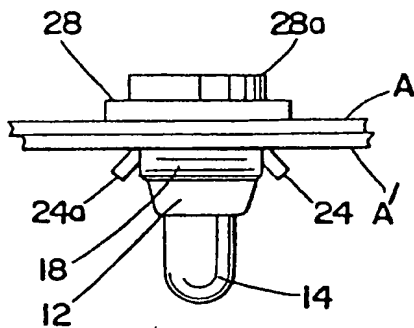
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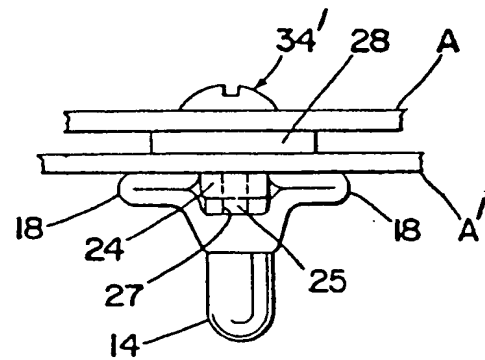
*Fig. 9*



*Fig. 10*



*Fig. 11*



*Fig. 12*